

# **Sustainable Energy Use and Energy Supply – A Challenge for the Future**

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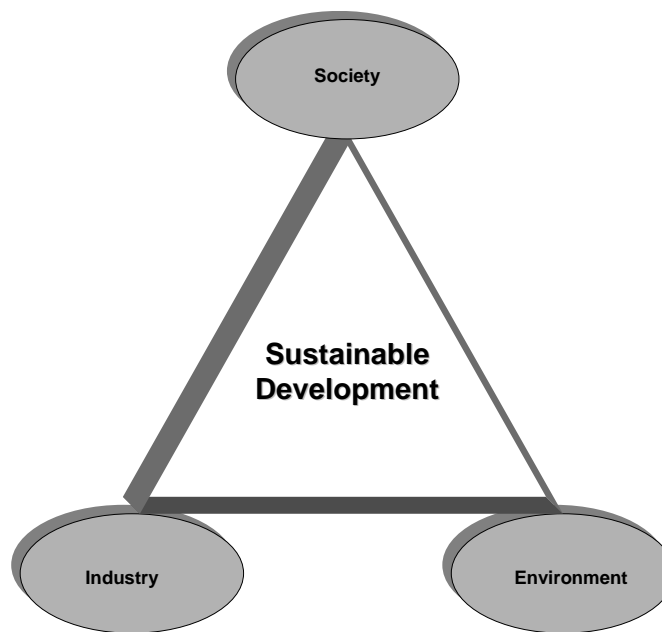
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# 1 Global Issues

The term Sustainable Development refers to a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>1</sup> Since publication of the Brundtland Report in 1989, Sustainable Development represents an important element in the political debate on future environmental, economic and societal development (see Fig. 1), i.e. searching for a balance between these different dimensions represents a major task.<sup>2</sup>

The work of the Brundtland Commission lead directly to the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. The Rio Declaration and Agenda 21 represent the main results of this important conference. Chapter 38 of Agenda 21 called for the creation of a Commission on Sustainable Development (CSD). In 1992, the United Nations General Assembly set out the CSD’s terms of reference, composition, guidelines for NGO participation, organisation of work, relationship with other UN bodies, and Secretariat arrangements. It is the task of this commission to keep the Rio process moving and to stimulate it furthermore.<sup>3</sup>



**Figure 1: Three dimension of sustainable development**

Conventions, e.g. the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biodiversity, play an important role in the Rio process in order to work out more detailed conceptions for Sustainable Development, i.e. to specify goals, to derive indicator sets and to implement verification procedures.

In 1997 at the conference Rio+5 in New York, the progress of the Rio process so far achieved was evaluated. The results from this evaluation were not very promising.

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<sup>1</sup> World Commission on Environment and Development: Our Common Future. Oxford, New York 1987. s. S. 43.

<sup>2</sup> Gro Harlem Brundtland was chairperson of the World Commission on Environment and Development.

<sup>3</sup> IISD: Earth Negotiations Bulletin 22, 51. [www.iisd.ca/linkages/2002/wssd](http://www.iisd.ca/linkages/2002/wssd)

The speed of the Rio process was lower than expected and limited by the lack of financial resources.

With increasing duration of the Rio process, issues of financing are more and more given priority. Thus, great significance was attached to the international conference “Financing for Development” which took place in Monterrey/Mexico in March 2002 as a prelude to the world summit. The conference was particularly concerned about the mobilisation of private and public, local and external financial resources for Sustainable Development.<sup>4</sup>

The World Summit on Sustainable Development (WSSD) held at Johannesburg in 2002 aimed at (re)focussing the Rio process on the most relevant topics and to accelerate the overall process. Five key thematic areas have been identified: Water, Energy, Health, Agriculture and Biodiversity (WEHAB).<sup>5</sup> The Johannesburg Plan of Implementation and the Johannesburg Declaration represent the most important results of the World Summit. The Plan of Implementation addresses the following topics:<sup>6</sup>

- Poverty Eradication;
- Changing Unsustainable Patterns of Consumption and Production;
- Protecting and Managing the Natural Resource Base of Economic and Social Development;
- Sustainable Development in a Globalizing World;
- Health and Sustainable Development;
- Sustainable Developments of Small Island States;
- Sustainable Development for Africa;
- Means of Implementation and
- Institutional Framework for Sustainable Development.

This list shows a multilevel approach. At the first level specific problems are addressed (topics 1 – 5). Another level addresses regional issues (topics 6 and 7). Topics 8 and 9 are devoted to implementation and a corresponding institutional framework.

The Summit reaffirmed Sustainable Development as a central element of the global agenda and was implemented a new impetus to global action to fight poverty and to protect the environment. The summit enabled a broadening of the understanding between the environment and the use of natural resources. In this context the summit confirmed in the Johannesburg Declaration on Sustainable Development the importance of the three dimensions of sustainable development - economy, society and environment – at the local, national and global level.

The post Johannesburg process focuses on the five core elements of WEHAB. The WSSD has detected that fundamental changes in the way societies produce and consume are indispensable for achieving global sustainable development. Therefore, all countries should promote sustainable consumption and production patterns.<sup>7</sup>

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<sup>4</sup> United Nations - General Assembly: Report of the Secretary-General to the Preparatory Committee for the High-level Intergovernmental Event on Financing for Development. New York, 18 December 2000. (A/AC.257/12.)

<sup>5</sup> WEHAB initiative proposed by UN Secretary-General Kofi Annan as a contribution to the preparations for the World Summit on Sustainable Development (WSSD).

<sup>6</sup> United Nations: Report of the World Summit on Sustainable Development. Johannesburg, South Africa. 26. August – 4. September 2002. New. York 2002.

<sup>7</sup> The WSSD concluded that a critical challenge in the future would be to ensure the necessary internal conditions for mobilizing, domestic savings, sustaining an adequate level of productive investment and increasing human capacity.

In the energy sector the Summit concentrated on four major topics: renewable energy, access to energy, energy markets and energy efficiency. The Summit concluded with the aim to diversify the energy supply by a substantial increase of the share of renewable energy to the total energy supply. The WSSD also stresses the necessity to improve the access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy resources and services. This includes the removal of market distortions including the restructuring of taxes and the phasing out of harmful subsidies and support efforts to improve the functioning, transparency and information about energy markets with respect to both supply and demand, with the aim of achieving greater stability and to ensure consumer access to energy services.<sup>8</sup> This includes efforts to improve the energy efficiency and the promotion of research and development.<sup>9</sup>

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<sup>8</sup> UN, 2002a

<sup>9</sup> Wolfensohn, 2002

## 2 The German Sustainability Strategy "Perspectives for Germany"

### 2.1 Sustainable Development in Germany

Germany takes an active role in participating in the Rio process, adopting it to national conceptions and to support other countries on their path to Sustainable Development. Milestones of the German Rio Process are the commitment to the goals and actions of the Rio Declaration and the Agenda 21 as well as signatures to the corresponding UN conventions, e.g. UNFCCC etc.

During the past five years German Federal Government took several actions:

- In summer 2000 the Federal Cabinet adopted a bill according to which a *Council for Sustainable Development (Nachhaltigkeitsrat)* was to be instituted by the Federal Government at the beginning of the following year. Its task should be to participate in the development and formulation of a sustainability strategy for the Federal Republic of Germany. For this purpose, high-ranking representatives of different social groups in the Federal Republic of Germany – such as representatives of the two Christian churches, the consumer associations, the local authorities as well as industry and science – were appointed to this panel by the Federal Chancellor.
- Moreover, the red-green Federal Government agreed on the institution of a *State Secretary Committee for Sustainable Development*. In this committee, which is called the "Green Cabinet" - (following the appointment of so-called "Green Ministers" in the United Kingdom) - the State Secretaries from ten of the in total 14 federal ministries meet. The Committee is chaired by the State Secretary of the Federal Chancellery. Its task also consists in developing a national sustainability strategy on behalf of the Federal Government. Moreover, it has to define concrete projects for the implementation of the sustainability strategy. In addition, the State Secretary Committee was granted the right to charge both the Council for Sustainable Development and the individual bodies of the Bundesrat with developing contributions to a federal German sustainability strategy. Moreover, it is entrusted with the task of informing the Federal Cabinet – as the competent decision-making body – about the results obtained.

Both the "Green Cabinet" and the Council for Sustainable Development took up work in the course of 2001. The first concrete results have been presented to the public in spring 2002.

The "Green Cabinet" published its first considerations on Sustainable Development in late 2001 in the form of a first draft of a national sustainability strategy for Germany. The "Green Cabinet" selected a form of presentation comprising four target levels with associated lower-level indicators. These four target levels comprise the topics of generation justice, quality of life, social bonds and international responsibility.

As a result of this work, in preparation of the conference in Johannesburg, and to fulfil obligations resulting from Agenda 21 German Government presented a report to WSSD on the national strategy for Sustainable Development comprising the same key areas:

- Generation Justice;
- Quality of Life;

- Social Co-operation and
- International Responsibility.

Progress in these areas is measured by 21 indicators referring to corresponding goals (see Tab. 1).<sup>10</sup> It is striking to note that the focus is on the social dimension.

Generation Justice	Quality of Life	Social Bonds	International Responsibility
conservation of resources	economic prosperity	employment	development cooperation
climate protection	mobility	prospects for families	opening markets
renewable energies	nutrition	equal rights	
land use	air quality	integration of foreign citizens	
biodiversity	health		
national indebtedness	crime		
economic precautions for the future			
innovation			
education			

**Tab. 1: The targets and target indicators of the “Green Cabinet”**

German Parliament also contributed to the national strategy on Sustainable Development. Over the past legislative periods Study Commissions actively analysed the options for sustainable development with respect to individual fields, e.g. materials flows, mitigation of climate change, and energy supply. The Study Commissions first laid a basis for the political formulation of emission reduction goals. Subsequently, a Study Commission dealt with the topic of “Sustainable Energy Supply in View of Globalisation and Liberalisation”.<sup>11</sup>

Moreover, Germany participated in an OECD study to evaluate the information resulting from the implementation of such a detailed indicator set describing (sustainable) development in individual countries.<sup>12</sup>

In all studies the importance of the energy dimension to Sustainable Development is stressed because the energy dimension is regarded as cross-cutting to the environmental, economic and social dimensions.

<sup>10</sup> Die Bundesregierung: Perspektiven für Deutschland – Unsere Strategie für eine nachhaltige Entwicklung. Berlin, April 2002.

<sup>11</sup> Deutscher Bundestag: Erster Bericht der Enquete-Kommission Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung. Drucksache 14/7509, Berlin 2001 and Deutscher Bundestag: Zweiter Bericht der Enquete-Kommission Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung. Drucksache 14/9400, Berlin 2002. See further information: <http://www.bundestag.de>

<sup>12</sup> Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Erprobung der CSD-Nachhaltigkeitsindikatoren in Deutschland – Bericht der Bundesregierung. Berlin, April 2000.

## **2.2 The Key Issues of the German sustainability concept**

### **2.2.1 Intergeneration equity**

A new generation contract was the starting point of the Federal Government for the development of a sustainability strategy. This reconciles the interests between generations by taking into account the discussion about the national public finance deficit, the pension reform, the natural bases of life and the costs of the health service consider. The Federal Government stated that the generation contract presupposes a basic fundamental agreement over values and social aims of the development of society.

- The Government assumes that the realization of intergeneration equity has to consider three aspects. First, the preservation of the natural bases of life.
- The increase of efficiency –the realization of the vision of factor 4 or 10.
- A sustainable management strategy has to consider the sustainability of financial policy of the state by reducing the national public deficit, encouraging individual responsibility, shaping structural change, dismantling of conflicting aims between economic and ecological interests, regulatory policy and the use of free market instruments, and eco-labeling for companies using sustainability management strategies.

The first group of the indicators covers 9 issues of sustainability (table 1) - conservation of resources, climatic protection, renewable energies, land use, biodiversity, national debt, provision for future economic stability, innovation, education and training. These indicators should enable us to analyze, whether the government realizes the goal of the generation justice.

Table 1: Sustainability Indicators of the German Government - Intergeneration equity*										
	1997	1998	1999	2000	2004	2006	2010	2015	2020	2050
<b>I. Intergeneration equity</b>										
1. Energy & Raw materials produktivity (1994=100)										
Energy			120				160		200	
Raw materials			117				158		200	
2. Emissions of the six greenhouse gases covered by Kyoto Protocol (1990=100)										
				81,3			79			
3. Proportions of energy consumption from renewable energy										
in % primary energy consumption				2,1			4,2			
in % electricity consumption				6,3			12,5			50
4. Land use for housing and transport - increase in ha per day										
				129					30	
5. Development of stocks of selected animal species (1995 = 100)										
			98,2	95,4			-		-	
6. Public finance deficit - in % of GDP										
			1,6	1,3	0,5	0				
7. Provision for future economic stability - Gross capital formation in relation to GDP										
			22,6	22,5						
8. Innovation - private and public expenditure on research and development										
			2,45	2,46			3,0			
9. Education and training										
25-year-olds with completed education				6,0			9,5			
Leaving secondary school without certificate				9,0			4,0			
University entrance rate				30,2			40,0			

\*) German Government, Perspectives for Germany, Berlin 2002.

The Federal Government has set up the goal to almost double the energy and raw materials productivity of the national economy in Germany by 2020 and simultaneously reduce the greenhouse gas emissions by 2,8 %. Moreover, the Government is seeking to increase the portion of renewable energies on the nation's energy consumption. In 2050, the portion of the renewable energies should be 50% of the national energy consumption.

The Federal Government wants to lower also the increase of the utilization of land of 129 hectares per day to 30 hectares per day in 2020. The Government also encourages the preservation of the biodiversity in Germany.

Additionally the German Government will reduce the public finance deficit and plans to present a balanced budget in 2006. The Federal Government considers that the economic investment ratio (Gross capital formation in relation to GDP) should increase significantly. The present investment ratio is about 21,3% this is about 2% lower than 1992. The Government considers a higher rate of investment across the whole economy essential for a sustainable development.<sup>13</sup> The government aims for an increase of the private and public expenditures for research and development issues from recent 2,5% to about 3% in 2010.

<sup>13</sup> German Government, 2002

In addition, in the education field the Federal Government wants to increase the investment rate. The Government has established the objective to increase the proportion of young people taking up a university place about 10% from 30.2% to around 40%. Simultaneously the Government tries to reduce the student dropout rate. In addition, the Government will achieve a significant increase of the percentage of the 25-year old with a university and/or a specialized university degree.

## 2.2.2 Quality of Life

The core of sustainability concept of the German Government is the maintenance of the economic prosperity of society. The Government defines six indicators to describe the quality of life: economic prosperity, mobility, nutrition, air quality, health, and crime.

	1997	1998	1999	2000	2004	2006	2010	2015	2020
II. Quality of Life									
10. Economic prosperity									
GDP per capita in 1995 prices			23281	23950					
11. Mobility									
Transportintensity 1999=100									
Passenger traffic			100				90		78
Good traffic			100				98		95
Proportion of freight transported by rail			15%					25%	
Proportion of inland shipping	8%							14%	
12. Nutrition									
Proportion of organic farming in %				3,2			20		
Nitrogen surplus (kg/ha)				116,6			80		
13. Air quality									
Concentration of air pollution 1990=100			54	52			30		
14. Health									
Premature mortality (below 65)									
Women			150						
Men			300						
Satisfaction with Health									
Men				6,6					
Women				6,4					
15. Crime									
Burglaries involving a break-in				140000			126000		

\*) German Government, Perspectives for Germany, 2002

The GDP describes the economic prosperity of society per capita. The Government selected mobility as the second indicator for the quality of life. The major goal of the Government is to decouple economic output and transport output by reducing the transport intensity about 5% in freight transport and about 20% in passenger transport by the year 2020. Additionally the freight transport by rail should be doubled to the 1997 volume. Inland shipping is set to increase its share of transport intensity by around 40% in the same period.

Healthy nutrition is, for the government, a further indicator of the quality of life. The Government plans to increase the share of organic farming from 3,2% in 2000 to 20% in 2010. Simultaneously the Federal Government set the goal to reduce the nitrogen surplus of the agricultural sector from currently 116 kg/ha to 80 kg/ha.

Emissions should not only be reduced in agriculture. By 2010, concentration of the main air pollutants should be reduced on a scale of around 70% compared with 1990. Health is the central aspect of the quality of life of the people. The Government has chosen two indicators to measure the health of the German society: “premature mortality (below the age of 65)” and the “satisfaction with health”. For both indicators the Government has not defined objectives. To feel personal security is another important aspect for the quality of life the German Government assumes. Therefore, the Government takes crime in the list of indicators.

The third group of indicators covers the social dimension of sustainability.

### 2.2.3 Social Cohesion

The Government assumes that against the background of the rapid structural change of the world economy the administration has the duty to enhance the social security system. Social security is seen as an important aspect of a sustainable development. The following four indicators describe the indicator category social cohesion: employment, perspectives for families, equal opportunities, and integration of foreign citizens.

	1997	1998	1999	2000	2004	2006	2010	2015	2020
III. Social cohesion									
16. Employment									
Employment rate				65,4			70		
17. Perspectives for Families									
Full-time day-care facilities in the West German Länder									
0-3 Jahre		2,2					30		
3-6,5 Jahre		16,3					30		
6,5 - 12,5 Jahre		3,4					30		
18. Equal opportunities									
Comparison of gross annual earnings from full-time employment (Women and Men aged between 35 and 39 (West German Länder)	76						85		
19. Integration of foreign citizens									
Foreign school leavers not gaining the first secondary school-leaving certificate	17,1	17	16,7	16,1					9

\*) German Government, Perspectives for Germany, 2003

Employment is the first indicator of the social cohesion category. The German Federal Government strives to raise the employment rate to 70% in 2010 from around 65% in 2000. The Government also plans to improve the living conditions of families by better full-time-day-care facilities. Hence, the Government wants to improve the relationship of gross annual earnings from full-time employment of women and men between 35 and 39 from current 76% to 85% in 2010.

The integration of the foreign population groups in the German society is an important aspect of social cohesion for the German Federal Government. The Government is trying to improve especially the language skills. Insufficient language

skills are the main reasons for the higher rate of unemployment among foreigners. By 2020, the proportion of foreign school-leavers without secondary school-leaving qualifications of about 16,1% should be brought closer to the rate of German school-leaver of 9%.

The fourth category of the sustainability strategy of the Federal German Government is international responsibility.

**2.2.4 International Responsibility**

The German Government considers that Germany is an integral part of the world, especially in the context of globalization and climate protection. The Government defines two indicators for measuring the international responsibility of its policy. Two indicators seize the fourth category international responsibility: development cooperation and open markets.

	1997	1998	1999	2000	2004	2006	2010	2015	2020
IV. International responsibility									
20. Public development cooperation (in % GDP)			0,27			0,33			
21. Open Markets									
EU imports from developing countries (EUR billion)	263	268	304	420					

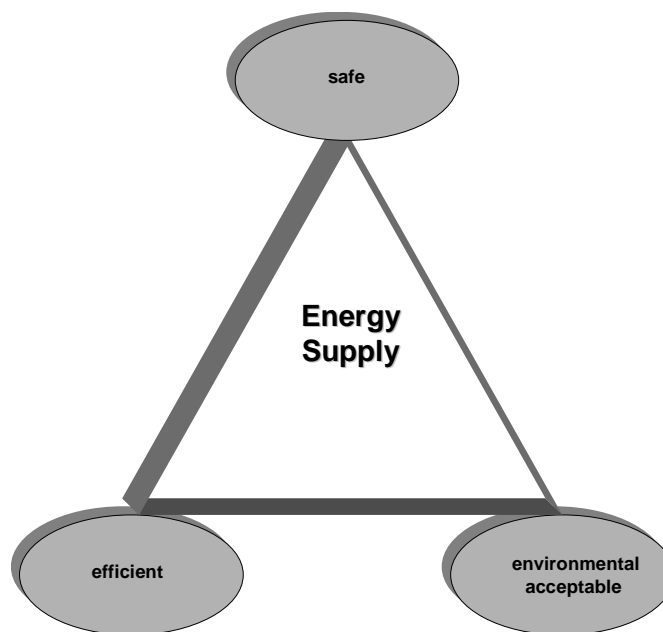
\*) German Government, Perspectives for Germany, 2002

Development cooperation is measured in public development cooperation expenditures in % of Gross Domestic Product. The expenditures should increase to 0,33% in 2006 but still missing the internationally defined goal of 0,7% of GDP. Furthermore, the Government strives to achieve an opening of the European markets for goods from developing countries, to give them equal opportunities.

## 3 The Energy Dimension of Sustainable Development

### 3.1 Global Issues

Management of energy supply according to guiding principles (e.g. safe, efficient and environmental acceptable) has always been in the tradition of the energy economy. Again, a solution with respect to multiple criteria is required (Fig. 2).



**Figure 2.: Three-pillar concept of energy supply**

#### 3.1.1 Brundtland-Commission

In the seventh chapter of its final report “Our Common Future”, the Brundtland Commission dealt at great length with the topic of energy. The introductory formulations there read as follows: “Energy is necessary for daily survival. Future development crucially depends on its long-term availability in increasing quantities from sources that are dependable, safe, and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need.”<sup>14</sup>

The central question is how to ensure a globally permanent and reliable energy supply in the future. The commission arrives at the following conclusions here: present-day energy supply is based to a major extent on fossil fuels such as oil, coal and natural gas. Abandoning the use of these energy carriers on a larger scale does not seem possible. At all levels, however, there are great potentials for a more efficient use than in the past. The Brundtland Commission derives the following claims for a Sustainable Development in the energy sector:

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<sup>14</sup> World Commission on Environment and Development: Our Common Future. Oxford, New York, 1987, p. 168.

- expansion of energy supply to meet the demand for energy services to a sufficient extent world wide,
- measures to improve efficient energy use,
- reduction of health risks associated with energy use,
- measures for the protection of the biosphere and prevention of the increase of local environmental pollution.

The recommendations derived by the Brundtland Commission can be subsumed under the following keywords:

- lowering specific per-capita energy consumption,
- expanding the investments for the development of technologies and mechanisms resulting in a reduction of energy consumption and
- reducing the provision of energy from non-renewable resources.

In order to achieve these goals also in practice, the Brundtland Commission considers fundamental political and institutional adaptations in the energy sector to be necessary. At the same time, it underlines that a specific reduction in energy consumption can only be achieved by an optimum use of the currently available energy sources. Optimum use is understood by the commission to be the consumption of the least expensive environment-friendly energy source.<sup>15</sup>

The industrialised countries are under a particular obligation because one quarter of the world population (and this primarily in the industrialised countries) consumes roughly 75 percent of the globally used primary energy.<sup>16</sup> The Brundtland Commission supports a more effective and efficient use of the energy sources available to date. At the same time, however, it is also a concern of the commission to develop plans and programmes for the long-term generation and use of renewable energy carriers. The Brundtland Commission regards the energy price as an important element for promoting the use of renewable resources.

### **3.1.2 UN-Summit in Rio de Janeiro**

The 9<sup>th</sup> chapter “Protection of the Atmosphere” of the Agenda 21 summarises the demands and suggestions concerning a sustainable energy use and energy supply, i.e. “Energy is essential to economic and social development and improved quality of life. Much of the world’s energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially.”<sup>17</sup>

The basic and ultimate objective of the energy topic in the Agenda 21 is to reduce adverse effects on the atmosphere from the energy sector by promoting policies or programmes, as appropriate, to increase the contribution of environmentally sound and cost-effective energy systems, particularly new and renewable ones, through less polluting and more efficient energy production, transmission, distribution and use. This objective should reflect the need for equity, adequate energy supplies and increasing energy consumption in developing countries, and should take into consideration the situations of countries that are highly dependent on income generated from the production, processing and export, and consumption of fossil fuels and associated energy-intensive products or the use of fossil fuels for which

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<sup>15</sup> World Commission on Environment and Development: Our Common Future. Oxford/New York, 1987, p. 196.

<sup>16</sup> *ibid.*

<sup>17</sup> United Nations Division for Sustainable Development: Agenda 21. Chapter 9. New York 1992.

countries have serious difficulties in switching to alternatives, and the situations of countries highly vulnerable to adverse effects of climate change.

The following concrete measures and their implementations are proposed in the Agenda 21<sup>18</sup>:

- Cooperation in identifying and developing economically viable, environmentally sound energy sources to promote the availability of increased energy supplies to support sustainable development efforts, in particular in developing countries;
- Promoting the development at the national level of appropriate methodologies for making integrated energy, environment and economic policy decisions for sustainable development through environmental impact assessments;
- Promoting the research, development, transfer and use of improved energy-efficient technologies and practices, including endogenous technologies in all relevant sectors, giving special attention to the rehabilitation and modernization of power systems, with particular attention to developing countries;
- Promote the research, development, transfer and use of technologies and practices for environmentally sound energy systems, including new and renewable energy systems, with particular attention to developing countries;
- Promote the development of institutional, scientific, planning and management capacities, particularly in developing countries, to develop, produce and use increasingly efficient and less polluting forms of energy;
- Review of current energy supply mixes to determine how the contribution of environmentally sound energy systems as a whole, particularly new and renewable energy systems, could be increased in an economically efficient manner, taking into account respective countries unique social, physical, economic and political characteristics, and examining and implementing, where appropriate, measures to overcome any barriers to their development and use;
- Coordination of energy plans regionally and subregionally, where applicable, and study the feasibility of efficient distribution of environmentally sound energy from new and renewable energy sources;
- in accordance with national socio-economic development and environment priorities, evaluate and, as appropriate, promote cost-effective policies or programmes, including administrative, social and economic measures, in order to improve energy efficiency;
- Build capacity for energy planning and programme management in energy efficiency, as well as for the development, introduction, and promotion of new and renewable sources of energy;
- Promote appropriate energy efficiency and emission standards or recommendations at the national level, aimed at the development and use of technologies that minimize adverse impacts on the environment;

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<sup>18</sup> United Nations Division for Sustainable Development: Agenda 21. Chapter 9. New York 1992.

- Encourage education and awareness-raising programmes at the local, national, subregional and regional levels concerning energy efficiency and environmentally sound energy systems;
- Establish or enhance, as appropriate, in cooperation with the private sector, labelling programmes for products to provide decision makers and consumers with information on opportunities for energy efficiency.

These topics do not present solutions but outline the fundamental challenges of Sustainable Development with respect to the energy question.

### **3.1.3 UN-Summit in Johannesburg**

Since the adoption of Agenda 21 the energy issue has been at the centre of the Rio process – either directly, if aspects of supply for humans are concerned, or indirectly, if the anthropogenic greenhouse effect is dealt with. At the special session of the United Nations General Assembly in 1997 (“Rio plus 5”) the interdependence of Sustainable Development and the production, distribution and use of energy was emphasised once again. The General Assembly declared this topic to be a priority of work of the United Nations Commission on Sustainable Development (CSD-9) in 2001. In preparation of the debate the United Nations Development Programme (UNDP), the United Nations Department of Economic and Social Affairs (UNDESA) and the World Energy Council (WEC) had a “World Energy Assessment” carried out. The results have been available since the year 2000.<sup>19</sup> The associated report constitutes a comprehensive review of the social, economic and ecological aspects of energy supply and its use and of issues of supply assurance, but the report hardly addresses the structural change in the energy sector currently taking place at company level.

For the range of energy use and energy supply in the apron of the summit in Johannesburg five outstanding characteristics were identified (Tab. 2).

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<sup>19</sup> UNDP – UNDESA – WEC: World Energy Assessment – Energy and the Challenge of Sustainability. New York 2000.

Key Issue	Action Areas
1. Access to energy and modern energy services	<ul style="list-style-type: none"> <li>- Reduce poverty by providing access to modern energy services in rural and peri-urban areas.</li> <li>- Improve health and reduce environmental impacts of traditional fuels and cooking devices.</li> <li>- Improve access to affordable and diversified energy sources in Africa.</li> </ul>
2. Energy efficiency	<ul style="list-style-type: none"> <li>- Reduce poverty by providing access to modern energy services in rural and peri-urban areas.</li> <li>- Improve energy efficiency in all sectors using established practices on standards and labelling techniques.</li> <li>- Improve efficiency in power generation.</li> </ul>
3. Renewable energy	<ul style="list-style-type: none"> <li>- Progressively increase contribution of renewable energy mix of all countries.</li> <li>- Improve access to basic health care and education for poor people through the provision of renewable energy systems in primary health care centres and schools.</li> <li>- Promote the use of renewable energy in vaccine and immunisation programmes.</li> <li>- Provide the use of renewable energy to facilitate access to safe drinking water.</li> </ul>
4. Advanced fossil-fuel technologies	<ul style="list-style-type: none"> <li>- Increase the use of advanced fossil fuel technologies for energy generation.</li> <li>- Promote the use of clean coal technologies in countries using coal.</li> <li>- Reduce atmospheric pollution from energy generating systems.</li> <li>- Enhance productivity through advanced fossil fuel technologies.</li> </ul>
5. Energy and transport	<ul style="list-style-type: none"> <li>- Improve air quality and public health through the introduction of cleaner vehicular fuels.</li> <li>- Implement better transportation practices and systems in mega-cities.</li> <li>- Promote new technologies for transport.</li> </ul>

**Tab. 2: Energy – Frameworks for Action<sup>20</sup>**

At the world summit on Sustainable Development in Johannesburg, the energy issue had been on the agenda again in a prominent position under the heading "Access to Energy and Energy Efficiency". The focus in the energy sector during the Johannesburg-Summit was concentrated on the pre-work established by the WEHAB working group and was mainly summarized in four major topics: renewable energy, access to energy, energy markets and energy efficiency.

The Johannesburg Summit was terminated with the aim to diversify the energy supply by a substantial increase of the share of renewable energy to the total energy supply. The WSSD also pointed out the necessity to improve the access to reliable, affordable, economically viable, socially acceptable and environmentally sound energy services and resources. This also includes the removal of market distortions including the restructuring of taxes and the phasing out of harmful subsidies and support efforts to improve the functioning, transparency and information about energy markets with respect to both supply and demand. The aim was to achieve greater stability and to ensure consumer access to energy services. This includes efforts to improve the energy efficiency and the promotion of research and development.

### 3.2 Germany

The focus of the German Green Cabinet is also on the energy sector. The main goal consists of decoupling the demand for energy and other natural resources from economic growth. Specific action should take place in the following fields:

- reduction of primary energy demand by increased efficiency and rational use of energy,

<sup>20</sup> WEHAB Working Group: A Framework for Action on Energy. World Summit on Sustainable Development, Johannesburg 2002.

- improvements in energy services, and
- emphasis on renewable energy and reduced usage of fossil and nuclear energy.

The Green Cabinet also recommends the implementation of specific national goals and measures such as reduction of greenhouse gas emissions by 21 % from 1990 to 2012, the reduction of CO<sub>2</sub> emissions by 25 % up to 2005, a doubling of the share of renewable energy until 2010 with respect to the year 2000, and combined heat and power production. Moreover, pilot studies and projects have been initiated to increase energy efficiency in all sectors of the economy.<sup>21</sup>

A Study Commission of German Parliament dealt with the topic of “Sustainable Energy Supply in View of Globalisation and Liberalisation”.<sup>22</sup> Preliminary results from this commission have been presented to CSD 9 at New York. The outcome of this commission is a set of 71 indicators for the energy sector (see Tab. 3), and a set of scenarios reflecting the fundamental options for future development of the energy sector up to 2050. The report concludes with a detailed discussion of instruments and measures suitable to direct the energy sector towards the desired goals. A final chapter is devoted to implementation of the strategy.

<b>Ecological Dimension</b>	Emissions of GHG Emissions of air pollutants Acidification Settlement area Area consumption Non-toxical and non-nuclear waste Toxical waste Nuclear waste Nuclear inventory
<b>Social Dimension</b>	Labour Employment rate Household expenses for energy consumption
<b>Economic Dimension</b>	Total primary energy supply Renewable energy Nuclear energy Fossil fuels Biomass Primary energy supply per GDP Energy consumption and demand of transportation Energy consumption and demand of households Share of fossil fuels and REN for power generation Range of coverage of different energy sources Total costs of energy supply and energy use Import quota of energy sources
<b>Innovative Dimension</b>	R&D-Expenses for energy supply and energy use R&D-Expenses for fossil fuels R&D-Expenses for nuclear fuels R&D-Expenses for REN Coverage of development aid

**Tab. 3: Core Indicators of the Study Commission “Sustainable Energy”**

<sup>21</sup> Secretary of State Committee for Sustainable Development: Perspectives for Germany. Our strategy for Sustainable Development. Draft of the national Sustainable Development Strategy. Berlin, in December 2001. Page 132 to 143.

<sup>22</sup> See for further information: <http://www.bundestag.de>

The indicators favoured by the Study Commission refer to an indicator set developed by the OECD.<sup>23</sup> But there exist differences because the commission looks at the energy sector from different perspective. Hence, there still exists the need for unification and comprehension.

The members of this commission did not agree on the overall future strategy for the German energy sector. Issues of controversy have been detected particularly in the following fields:

- perception of the risks resulting from climate change (i.e. starting from the worst case scenario published by IPCC?)
- attitude towards the impact of globalisation on the energy sector (i.e. catastrophe with respect to the social dimension of Sustainable Development?)
- role and precision of goals and instruments to direct structural change in the energy sector (i.e. how much regulation?)
- at the technical level: different opinions about the future role of nuclear energy (phase out?) and about renewable energy (how much and which subsidies?).

Besides the differences the commission emphasised the central role of education, science and research in the context of Sustainable Development.<sup>24</sup>

For energy research the European Commission decided to set priorities and a perspective with respect to Sustainable Development in the 6<sup>th</sup> Framework Programme:<sup>25</sup>

1. Research Activities having an Impact in the Short and Medium Term:
  - a. Clean energy, in particular renewable energy sources and their integration in the energy system, including storage, distribution and use.
  - b. Energy savings and energy efficiency, including those to be achieved through the use of renewable raw materials.
2. Research Activities Having an Impact in the Medium and Longer Term:
  - a. Fuel cells, including their application.
  - b. New technologies for energy carriers/transport and storage, in particular hydrogen.
  - c. New and advanced concepts in renewable energy technologies.
  - d. Capture and sequestration of CO<sub>2</sub>, associated with cleaner fossil fuel plants.
  - e. Socio-economic tools and concepts for energy strategy.

This structure shows three important elements. First, time plays a crucial role; i.e. development of technological alternatives as required and desired for Sustainable Development in the energy sector represents a time consuming process which can only be accelerated to a certain extent. Second, the range covered by research should start from basic research and must end with commercially competitive products. Third, great importance is attached to the future role of renewable energy.

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<sup>23</sup> OECD: Framework to measure Sustainable Development. Paris 2000.

<sup>24</sup> Study Commission „Sustainable Energy Supplies in View of Globalization and Liberalization“. Sustainable Power Supply on the liberalized and globalized markets: Stocktaking and starting points. Berlin 2001. Page 39 and 40.

<sup>25</sup> European Commission: The 6th Framework Programme. Brussels, December 2002.

## 4 Valuation of the German Sustainability Strategy in the Light of Johannesburg

The focus of the analysis will be made on some basic aspects of the German Sustainability Strategy in the context of the World Summit.

This evaluation of the German Sustainability Strategy will be based mainly on data of the Study Commission on "Sustainable Energy Supply in View of Globalisation and Liberalisation"..<sup>26</sup>

In February 2000 the German Parliament established the Study Commission. The Commission was given the mandate to furnish evidence to be used as basic for the German Bundestags decision making in the field of energy policy. In order to assess the prospects of sustainable development up to the year 2050, the commission has examined economic and technological capabilities as well as option for practical and political action. To this end, the Commission developed 14 scenarios and variations for Germany, with different assumptions and implementation perspectives. Based on these scenarios and the evaluation of additional studies the majority of the Commission believes that, "it is technically feasible and economically possible in a modern industrialized country to reduce greenhouse gas emissions by 80 per cent".<sup>27</sup>

But some experts and lawmakers of the Commission did not share all the conclusion of the majority. They expressed their concern, that isolated national efforts alone will not be sufficient in the view of the global dimension of the problem. They assume, that such targets cannot be attained without economic consequences and thus will have considerable adverse economic effects on Germany's attractiveness for business enterprises.

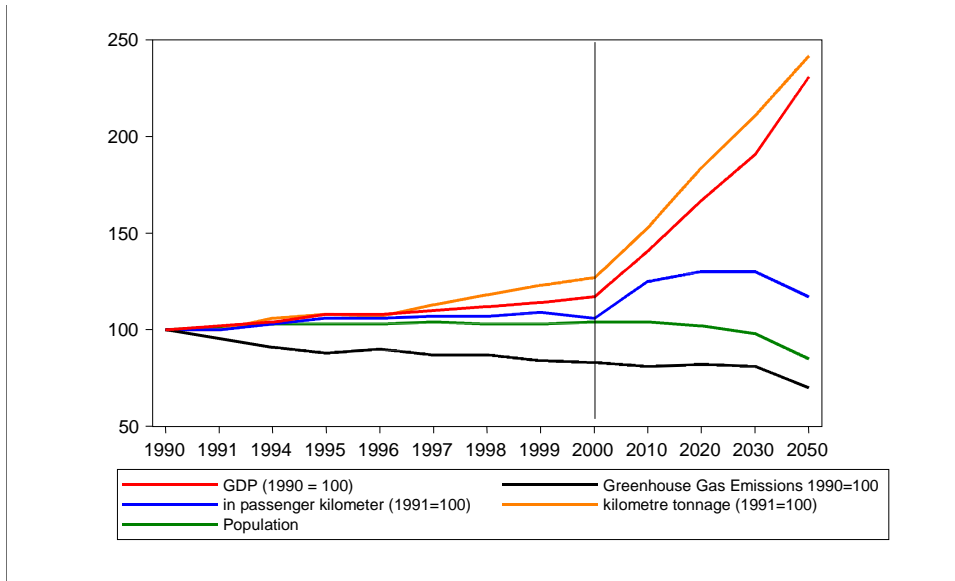
Based on this disagreement of the members of the commission, the analysis is mainly based on data of the Reference Scenario (business as usual scenario) of the Commission, because the Commission unanimously adopted this scenario. The reference scenario defines the future framework of political decisions.

The first figure shows, that the Commission expects that the German population decreases until 2050 and simultaneously the emissions of greenhouse gases also decline. The passenger transportation service will follow with a certain time lack. But the GDP and the freight transport intensity will soar in this time period about nearly 250%. This expected development makes clear that the Commission expects an increasing of the productivity of the German economy and confirms thereby the expectation of the German Government.

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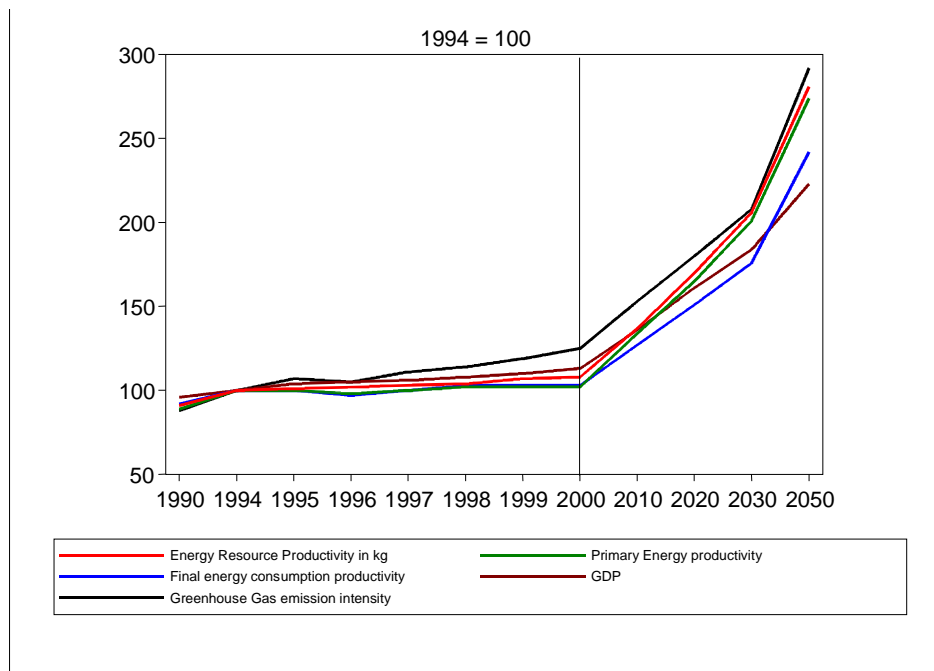
<sup>26</sup> Study Commission, 2002a,

<sup>27</sup> Study Commission, 2002b



**Figure 3: Reference-Scenario of Major Indicators<sup>28</sup>**

The next figure shows the expected development of major energy related indicators, which have a central meaning for sustainable development.



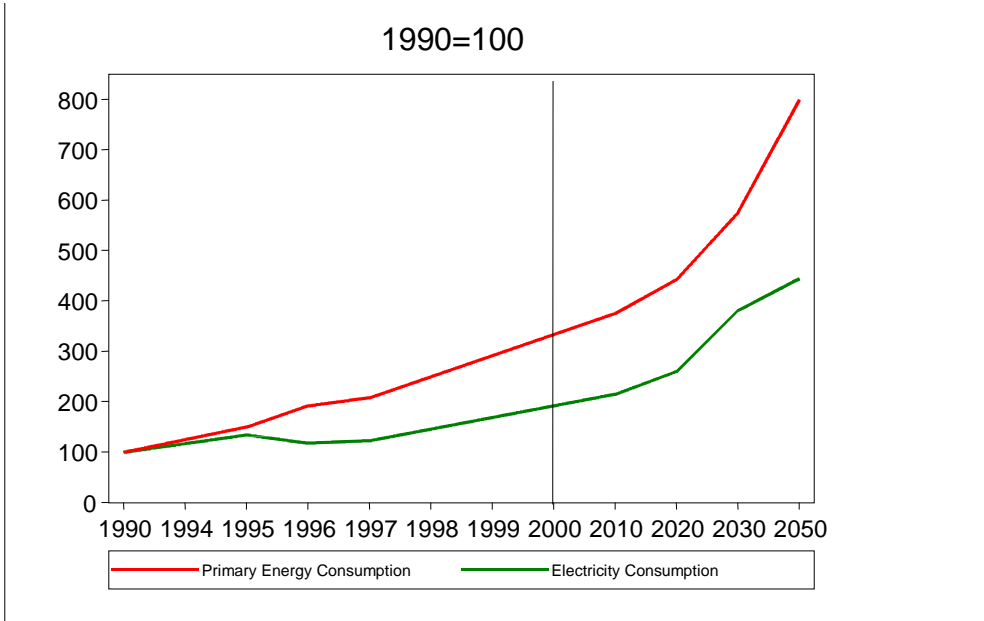
**Figure 4: Reference Scenario – Major Energy Indicators<sup>29</sup>**

<sup>28</sup> Source: STE-Calculation based on Study Commission, Energy Data 2002, Statistical Yearbook 2002, Verkehr in Zahlen 2002.

<sup>29</sup> Source: STE Calculations based on Study Commission, Energy Data 2002, Statistical Yearbook 2002.

These indicators show both the expectation of a soaring of energy related productivity in Germany and the rise of efficiency in the energy sector in the coming years.<sup>30</sup> The Greenhouse Gas emission productivity is expected to increase sharply about nearly 300% until 2050. This development confirms the expectations of the German Government.

The development of the emission intensity correspond directly with the extension of the renewable energy production in Germany, which is expected both from the German Government and the Study Commission as the following graphic shows.<sup>31</sup>



**Figure 5: Reference Scenario – Renewable Energy Consumption<sup>32</sup>**

The share of renewable energy consumption on the primary energy consumption will soar about 800% until 2050 and the share of renewable energy on electricity consumption will increase about more than 400%. This data confirms the optimistic evaluation of the German Government concerning the sustainable prospects of Germany and also shows that the Government is trying to fulfil the obligations made in Johannesburg.<sup>33</sup>

In order to support the development of the renewable energies the German government plans an international conference for the promotion of renewable energies. Germany has committed at the Summit in Johannesburg to promote both

<sup>30</sup> Hake, Rath-Nagel, Vögele, 2002

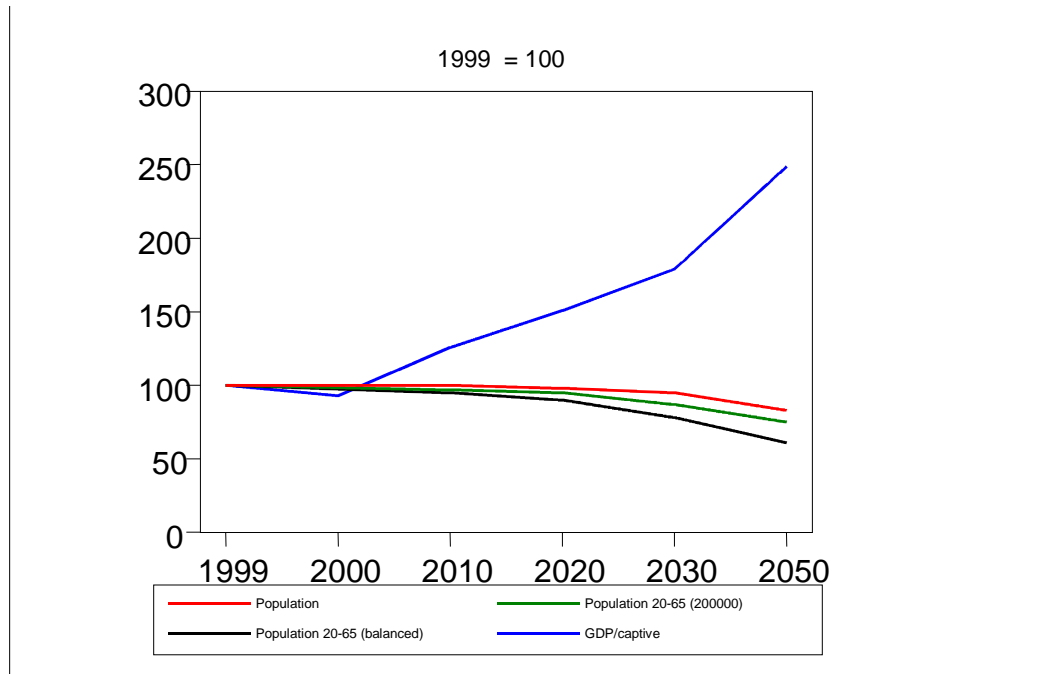
<sup>31</sup> Hake, Eich, 2002a, 2002b

<sup>32</sup> Source: STE Calculation based on Study Commission, Energy Data 2000, Statistical Yearbook 2002.

<sup>33</sup> Hake, Eich, 2003a

renewable energy use and the improvement of energy efficiency in developing countries with 1000 million in the coming five years.<sup>34</sup>

But we have to think about the explosion of productivity in Germany, which is partly responsible for this development.



**Figure 6: Reference Scenario – Population Indicators<sup>35</sup>**

The figure shows that the Commission expects that the total population will decrease over time and the Federal Statistical Office assumes that the working force will also decrease until 2050. The estimation of the working force is based on two scenarios. The first scenario assumes that Germany will have a net immigration of 200.000 persons a year for the next 50 years. The second scenario assumes that the volume of immigration and emigration is balanced.<sup>36</sup> It is obviously that working force will decrease about at least 20% until 2050 and the national income soar simultaneously about 250%. The future will show if the German economy is in the shape to produce such an economic performance.

At the moment we can doubt about that as the estimation of the current public deficit shows. It is estimated both from the World Bank and the OECD that the German public deficit will raise significantly in 2003. It is estimated that the German public deficit will rise to -3,4% in 2003. Hence Germany will not meet the Maastricht Criterion both in 2003 and in 2004. Germany will not meet the goal of the Sustainability Concept to get the federal budget balanced in 2006.

<sup>34</sup> German Federal Government, 2002b

<sup>35</sup> Source: STE Calculation based on Study Commission, Federal Statistical Office Germany 2000

<sup>36</sup> Statistisches Bundesamt, 2000

It seems that Germany is making progress in the issues related to energy consumption and CO<sub>2</sub> emissions and by the building of a renewable energy production basis for the economy and meeting thereby the requirements of the Johannesburg Declaration.<sup>37</sup> But in the case of public development aid and open markets Germany is not totally on a sustainable pathway in the sense of the Johannesburg Declaration.

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<sup>37</sup> Hake, Eich, 2003b

## 5 Conclusion

Sustainable Development represents an open process with respect to decisions of present and future generations. Societal and political decision making has to reflect that the understanding of the corresponding natural and social systems is not yet complete. For this reason, goals have to be specified with regard to this uncertainty. Hence, the processes of decision making should be transparent to a maximum degree. The assessment of the initiated developments and the possibility to correct misjudgements should represent standard features in the process of Sustainable Development.

Several institutes have started to evaluate existing and to formulate new goals with respect to Sustainable Development, to specify indicator sets which yet are not consistent and complete to describe the journey towards Sustainable Development. But progress can be observed at the global and national levels.

For the energy sector, the approach to Sustainable Development starts in many cases from the supply side of energy assuming that new and advanced technology will suffice to full-fill demand. The assessment of existing energy technologies does not yet show a consistent picture. This one-side approach focussing on efficiency will probably not be sufficient as many experts already have pointed out. Increased efficiency has to be complemented by rational use of energy including all aspects up to questioning consumption patterns particular in the industrialised countries.

The international treatment of model problems like climate change already indicates the difficulties to achieve international concerted action. The appropriate treatment of these model problems seems absolutely necessary with respect to Sustainable Development. But huge investments are required, particular in the least and less developed countries. How could science and research contribute to speed up? Hence, the gap between vision and reality can only be closed by intensified science and research.

The Federal Government undertook with its sustainability strategy the first attempt to define a sustainability strategy for the German society on the basis of quantifiable sustainability goals and thus to define the political framework of a sustainable policy approach. By the definition of the 4 corner points of its strategy (Intergeneration Equity, Quality of Life, Social Cohesion, and International Responsibility) the government has already accepted important aspects of the Johannesburg Declaration and affirmed the importance of international cooperation.<sup>38</sup>

The sustainability concept of the Federal Government is not yet such differentiated as the OECD approach or the World Bank genuine saving approach but for important German political issues there exist now a quantifiable sustainable development pathway.

The current problems with the German budget deficit and the development of the German trade with the developing countries have showed the difficulty to accomplish goals set in the sustainability strategy. But the analysis has also showed that in the area of the energy policy both the improvement of the energy efficiency and the

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<sup>38</sup> German Federal Government, 2002b, UN 2002b

development of the renewable energies are signals of sustainable progress in the sense of the Johannesburg Declaration.

It has to be critically remarked that the selection and the number of indicators so far are more based on political pragmatism as of scientific necessity: 21 indicators for 21. Century. Science should demand for a more scientific foundation of the chosen indicators<sup>39</sup>. Additionally the Federal Government should particularly increase the number of indicators for the corner point International Responsibility of its strategy, since two indicators are not sufficient to meet the requirements and the problems of a globalized world. It would be also desirable if the government could present for each individual indicator quantifiable goals for the next years and thereby defining a verifiable sustainability pathway for Germany.

Then, this path could be constantly examined by monitoring procedures and the goals and measures could constantly be adapted to new conditions. In this context, the German Council of Environmental Advisors (SRU) emphasized several times the lack of current, surface covering and comparable environmental data and the urgent necessity to improve the insufficient data situation to support monitoring procedures.<sup>40</sup>

Therefore the Council of Environmental Advisors points out that not the available data should define the indicator, but the chosen indicators should define the data. The government should take up these suggestions and should support an improvement of the database for advanced research.

Each German government is confronted by the necessity to shape a sustainable development framework for severe intergenerational problems (environment, social security, health care), which are characterised by the fact that the current generation have to bear the costs, and the benefits will be assigned to future generations.<sup>41</sup> Hence it is to be welcomed that the Federal Government wants to determine social, economic and environmental problems trying to solve intergenerational political issues in a long-term perspective. The future will show if the sustainability strategy, the chosen measures and the selected indicators will meet future challenges in a world of accelerating structural change.

Therefore the government should encourage an opinion making process in the EU about solving intergenerational problems. And Germany should emphasize the need of an enforced coordination of the EU member's activities especially in the field of climate change. The goal should be to present an integrated European approach in the UN discussion process about climate change.

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<sup>39</sup> Hake, Eich, 2003c

<sup>40</sup> SRU, 2002

<sup>41</sup> Hake, Schlör, 2003

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